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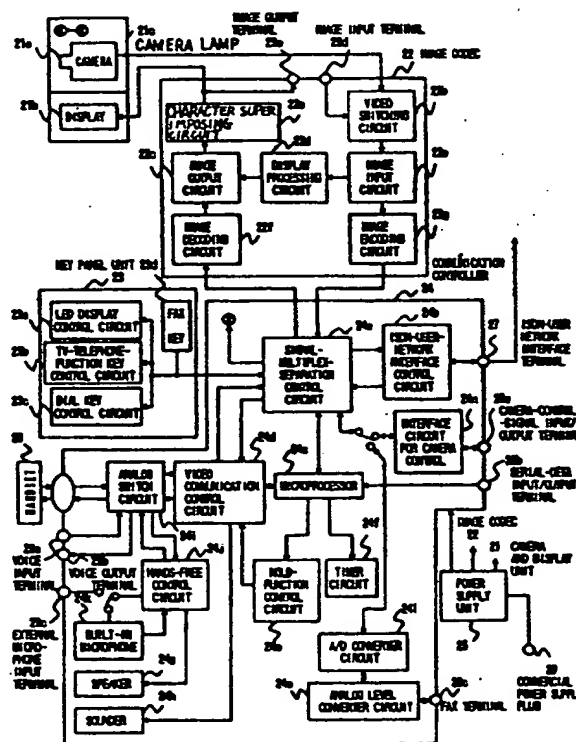
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⑤4 Video telephone.

57) A video telephone to be connected to the ISDN is a unitary structure comprising a communication controller(24) for controlling communication of digital data, such as voice signal, image signal and facsimile/camera control signal, a dial or key panel unit(23), a telephone controller(95) for controlling the functions of a handset(26) and the key panel unit(23), a camera(21a) for inputting an image, a display(21b) for outputting an image, and an image CODEC(22) for coding an input image signal and decoding a received image signal. The camera(21a) is tiltable and detachable.

FIG 1



## BACKGROUND OF THE INVENTION

### 1. Field of the Invention

This invention relates to a color motion-picture video telephone for communication of voice, image and other data in real time through a digital communication network.

### 2. Description of the Related Art

A color motion-picture video telephone is currently known which has a unitary structure composed of: a handset for communication of voice; a voice CODEC, a camera, a display and an image CODEC for communication of an image; and a communication controller for controlling such communications. In such a conventional television telephone, a single camera is tiltable between a normal horizontal position in which it can shoot the speaker in front of the telephone and a tilted position in which it can shoot a picture or a piece of writing placed on a desk or the like.

This prior art is exemplified by the collection of lectures and papers, (Volume 7) D-419, D-420, D-421, D-422, D-423 and D-424, presented at the National Spring Meeting of the Japanese Electric Information Communication Society.

Related Japanese applications by the present common assignee are, for example, Japanese Patent Application No. HEI 3-25987 for the structure of a video telephone and Japanese Patent Application No. HEI 3-25991 for the operation of a video telephone.

The conventional video telephone is disadvantageous in that the speaker must hold the handset in one hand for voice communication and that the camera has only a limited range of shooting. When shooting a picture or writing, the camera itself cuts off illumination of an interior lamp to throw a shadow over the picture or writing. Consequently there has been a requirement for a more convenient video telephone equipped with a wider variety of functions.

### SUMMARY OF THE INVENTION

It is therefore an object of this invention to provide a video telephone with which a picture or writing can be illuminated without casting the speaker's there on shadow and which has a hands-free function enabling the speaker to do voice communication without actually holding a handset.

According to this invention, there is provided a video telephone for exchanging image data, voice data and user data through digital communication lines in real time, which is comprised (I) a mainframe-and-display unit including (a) a commu-

nication controller for controlling communication of the image data, the voice data and the user data, which are multiplexed, through the digital communication lines, (b) a multiplex separator for separating the multiplexed image data, the voice data and the user data which are to be transmitted and received by the communication controller, (c) an image CODEC for decoding the image data, which are separated by the multiplex separator, into an image signal and for encoding an input image signal into image data and transmitting the image data to the multiplex separator, (d) a voice communication controller for decoding the voice data, which are separated by the multiplex separator, into a voice signal and for encoding an input voice signal into voice data and transmitting the voice data to the multiplex separator, (e) a speaker for outputting speech according to the voice signal decoded by the voice communication controller, (f) a microphone for producing a voice signal from speech, and transmitting this signal to the voice communication controller as the voice signal to be encoded, (g) a power supply unit for receiving a supply of power from an external source and for distributing the power to various parts, (h) a key input unit having a plurality of keys, (i) a control unit for controlling, in response to a key input from the key input unit, operating of the video telephone, and (j) a display for displaying an image represented by the image signal which is decoded by the image CODEC; and

(II) a camera unit including (k) a camera for producing an image signal, and outputting this signal to the image CODEC as the image signal to be encoded and (l) a lamp for illuminating a subject to be taken by the camera, the camera unit being angularly movably connected to the mainframe-and-display unit.

With this arrangement, since the camera angularly movably connected to the mainframe-and-display unit accommodates both a camera for outputting the image signal to the image CODEC as the image signal to be encoded and a lamp for illuminating a subject to be taken by the camera, it is possible to shoot a picture or a document using the camera as any potential shadow of the camera due to a lamp in the room is canceled by the built-in lamp.

### BRIEF DESCRIPTION OF THE DRAWINGS

FIG.1 is a block diagram of a video telephone according to one embodiment of this invention; FIG. 2 is a perspective view of the video telephone of FIG. 1;

FIG. 3 shows the video telephone of FIG. 2 with a camera unit having been removed;

FIG. 4 is a perspective view showing how var-

ious connectors are arranged on the rear surface of the video telephone;

FIG. 5 shows the arrangement of keys of a key panel unit on the video telephone;

FIG. 6 shows a system in which an external camera is connected to a video telephone;

FIG. 7 shows a video telephone to which an external video tape recorder is connected;

FIG. 8 is a diagram showing the sequence of caretaker image recording; and

FIG. 9 is a block diagram showing a video telephone with which voice communication is possible even when there is an interruption of the power supply.

## DETAILED DESCRIPTION

The principles of this invention are particularly useful when embodied in a video telephone such as shown in FIG. 1.

In FIG. 1, reference numeral 21a designates a camera; 21b, a display; 21c, a camera lamp; 21, a camera-and-display unit including the camera 21a, the display 21b and the lamp 21c; and 22, an image CODEC.

The image CODEC 22 includes a character superimposing circuit 22a, a video switching circuit 22b, an image output circuit 22c, a display processing circuit for controlling the display mode of the display screen, an image input circuit 22e, an image decoding circuit 22f for reproducing a picture signal from a received digital image signal, and an image encoding circuit 22g for converting a picture signal, which is outputted by the image input circuit 22e, into a digital signal for communication control described below.

Further, reference numeral 23 designates a key panel unit which includes an LED display control circuit 23a, a video-telephone-function key control circuit 23b, and a dial key control circuit 23c. Designated by 23d is a FAX key for controlling facsimile transmission.

Numeral 24 designates a communication controller which includes a signal-multiplex-separation control circuit 24a, an ISDN-user-network interface control circuit 24b, a microprocessor 24c for controlling various parts of the video telephone, a voice communication control circuit 24d, a hold-function control circuit 24e, a timer circuit 24f, a speaker 24g, a sounder 24h for generating a particular sound, and an analog switch circuit 24i. The communication controller 24 also includes a hands-free control circuit 24j, a built-in microphone 24k, an analog-to-digital converter circuit 24l for the facsimile interface, an analog level converter circuit 24m for the facsimile interface, and an interface circuit 24n for camera control.

Numeral 25 designates a power supply unit for

inputting a commercial supply of power from an external source via a commercial power supply plug 20 to supply a constant voltage to the camera-and-display unit 21, the image CODEC 22 and the communication controller 24.

Numeral 26 designates a handset connected to a mainframe of the telephone by a cable.

Numeral 27 designates an ISDN-user-network interface terminal; 28a, a camera-control-signal input/output terminal; 28b, a serial-data input/output terminal; 28c, a facsimile terminal; 29a, a voice input terminal; 29b, a voice output terminal; 29c, an external microphone input terminal; 29d, an image input terminal; and 29e, an image output terminal. These terminals are input/output connectors provided on the rear surface of the mainframe of the telephone.

In the image CODEC 13, the image processing devices may be contained on a single sheet (e.g., A4 size) of image CODEC substrate by integrating each of the image encoding circuit 22g and the image decoding circuit 22f on a single very small semiconductor chip. In the communication controller 24, all parts except the speaker 24g and the microphone 24k may be contained on a single sheet (e.g., A4 size) of communication controller substrate by integrating the ISDN-user-network interface control circuit 24b and the voice communication control circuit 24d on a single very small semiconductor chip and also integrating the signal-multiplex-separation control circuit 24a, etc. on a single very small semiconductor chip. The speaker 24g and the microphone 24k are directly attached to a mainframe 19 of the telephone. Thus the power supply unit, the two circuit substrates, the key panel unit 23 and the camera-and-display unit 21 as well as cables connecting these units are contained within the telephone, resulting in a unitary compact video telephone.

FIG. 2 shows the structure of the video telephone.

In FIG. 2, reference numerals 21b and 12a respectively designate the display and the camera, both at the head or top of an L-shaped body. 13 designates the image CODEC 22 containing the image CODEC substrate, occupying the neck or vertical support portion of the L-shaped body. 18 designates a mainframe containing the communication controller 24, the key panel unit 23, the power supply unit 25, the built-in speaker 24g and the built-in microphone 24k, occupying the bottom or base portion of the L-shaped body. The key panel unit 23 is equipped with telephone-function keys, video telephone control keys and indicator lamps. 26 designates the handset. Also the mainframe 18 is equipped with external input/output terminals, as described below.

Systematically, the image CODEC 13 is lo-

cated between the camera 21a, the camera-and-display unit 21b and the communication control system, which includes the signal-multiplex-separation control circuit 24a, the ISDN-user-network interface control circuit 24b. Therefore it is possible to simplify the wiring between the substrates and hence to realize a compactly unitized video telephone. Further, since air flows from the lower side to the upper side of the vertical substrate, the image CODEC 13 will have an increased heat radiation.

The camera 12a contains an auto-focusing compact color camera 21a and a lamp 21c, and is accommodated in a camera holder 12d angularly movably attached to the display 21b. The camera holder 12d is angularly movable between a normal horizontal position shown in FIG. 1, and a tilted position in which the camera 21a can shoot downwardly. Mounted on the camera holder 12d or the display 21b is a switch that will be turned on in response to the angular movement of the camera holder 12d over a predetermined angle with respect to the display 21b. While this switch is on, the microprocessor 24c controls the lamp 21c to be illuminated. The microprocessor 24c controls the lamp 21c to turn on/off according to a predetermined key input on the key panel unit 23.

At the joint of the camera holder 12d and the camera 12a, the camera holder 12d has a resilient mold complementary in shape to the joint end of the camera 12a so that the camera 12a can be attached to the camera holder 12d by being pressed into the camera holder 12d. Optionally the camera 12a may be removed from the camera holder 12d. For vertical fine adjustments, the camera 12a may be vertically slidable over a predetermined distance with respect to the camera holder 12d. Further the camera 21a may be slidable with respect to the camera 12a longitudinally along a shooting slot of the camera 12a. The camera 12a is connected to the mainframe 18 by a set cable of necessary signal lines and a power supply line. In FIG. 2, reference numeral 12c designates a switch for switching over between automatic iris and manual iris of the camera 21a, and 12b designates a fader type switch for illumination intensity adjustment.

FIG. 3 shows the camera 12a having been removed from the camera holder 12d; in this position, the camera 21a can shoot in any desired direction.

FIG. 4 shows various kinds of input/output terminals provided on the rear surface of the television telephone.

In FIG. 4, reference numeral 72 designates a commercial power supply cord for introducing an AC 100 V commercial power supply from an external source. The power supply is switched on and

off by a power supply switch 71. The ISDN-user-network interface terminal 27 is a communication interface normally connected with a dedicated cord. To the voice input terminal 29a, a voice signal (such as of that from a tape recorder) may be inputted via a dedicated cord. To the voice output terminal 29b, an external speaker or the like is connected via a dedicated cord to generate received speech. To the image input terminal 29d, an image signal (such as a television image signal or an external camera image signal) may be inputted via a dedicated cord. To the image output terminal 29e, a television receiver or the like may be connected via a dedicated cord to output a received image. To the serial-data input/output terminal 28b, a cable with an RS-232C interface connector may be connected to perform serial-digital-data transfer with, for example, a personal computer. To the camera-control-signal input/output terminal 28a, a cable with a dedicated digital interface connector may be connected to control and operate cooperatively with an external camera controller.

If an external microphone is connected to the external microphone input terminal 29c, it is automatically switched over from inputting a voice signal via the built-in microphone to inputting a voice signal via the external microphone. To the facsimile terminal 28c, an external facsimile may be connected.

With the video telephone according to this embodiment, since all of the external input/output interfaces are provided on the rear surface of the mainframe, various wiring cords connected with various external equipments can be grouped together to realize an expanded system with tidy wiring.

FIG. 5 shows the arrangement of keys on the key panel unit 23.

As shown in FIG. 5, a telephone-function key group 81, a video-telephone-control-function key group 82 and a dial key group 83 are arranged so as to occupy the respective three sections.

In the video telephone control function keys 81, LEDs are provided on the respective distal key heads of five function keys for indicating whether the voice-switching function (A-SW), the image-switching function (V-SW), the picture-quality-switching (high-picture-quality) function, the hands-free function and the camera function are set respectively. Therefore the user can easily ascertain the status of each function.

A power supply indication lamp 84 is turned on if the power supply switch 71 is switched on, and is turned off if the power supply switch 71 is switched off or if the power supply from an external source is cut off. An indication lamp 85 starts flashing simultaneously with the output of a call sound. The

speaker key is used in operating the hands-free function of the telephone-function key group 81.

The operation of the video telephone according to this embodiment will now be described.

As shown in FIG. 1, the ISDN-user-network interface control circuit 24b is equipped with output/input signal terminals for the input/output terminals, which correspond to 2B channels of the ISDN-user-network interface, of the signal-multiplex-separation control circuit 24a, and the ISDN-user-network interface input/output terminal 27. The ISDN-user-network interface control circuit 24b inputs a 2B-channel digital signal containing voice, image and data signals that are multiplexed by the signal-multiplex-separation control circuit 24a, multiplexes this inputted signal with a D-channel (16 kbps) signal, which is a communication line control signal, generates a signal equivalent to 2B plus D channels of the ISDN base interface and outputs this signal to the network. The ISDN-user-network interface control circuit 24b also inputs a signal equivalent to 2B plus D channels from the network, and separates a signal equivalent to 2B channel and outputs the separated signal to the signal-multiplex-separation control circuit 24a. Calling the destination terminal in order to be connected via the network, and controlling communication to connect with and disconnect from the destination terminal, are performed by the ISDN-user-network interface control circuit 24b.

The signal-multiplex-separation control circuit 24a has digital signal input/output functions for voice, image and data systems and multiplexes the digital signals of these three systems, i.e., the image inputted from the image encoding circuit 22g, the voice inputted from the voice communication control circuit 24d, and the data inputted from the microprocessor 24c, the camera control interface circuit 24n or the analog-to-digital converter circuit 24l, and sends them to the ISDN-user-network interface control circuit 24b as the digital signal equivalent to 2B (2X64 kbps) channels. The ISDN-user-network interface control circuit 24b separates the received 2B-channel digital signal into digital signals of the three systems and outputs the image to the image decoding circuit 22f, the voice to the voice communication control circuit 24d and the data to the microprocessor 24c, the camera control interface circuit 24n or the analog-to-digital converter circuit 24l.

In this embodiment, the total signal transmission speeds of the individual systems can be set optionally to a value equivalent to 2B channels, i.e. below 128 kbps; that is, bidirectional multiplex communication control by an arbitrary combination including the voice signal transmission speed of 56 kbps, the image signal transmission speed of 64 kbps and the data signal transmission speed of 8

kbps can be performed. The communication control is performed by the transmission method according to CCITT recommendations H. 221 and H. 242. The microprocessor 24c receives the setting of the signal transmission speeds of the individual systems by a special key input or a combination of key inputs from various kinds of keys of FIG. 5 and controls the signal-multiplex-separation control circuit 24a. To select the facsimile input/output connected to the facsimile input terminal as the data, the setting of the signal transmission speed is received by depressing the FAX key. Alternatively the setting of the signal transmission speed of each system may be received by indicating a predetermined menu on the display and depressing a menu key to make a key input corresponding to the menu.

Upon receipt of control by the microprocessor 24c, the signal-multiplex-separation control circuit 24a controls the function of the image CODEC 22, the lighting function of the LED indication control circuit 23a, the switching function of the video switching circuit 22b and the switching function of the analog switch circuit 24i.

The microprocessor 24c, which has a program connected in a memory, performs the function control of the image CODEC 22 via the signal-multiplex-separation control circuit 24a, the input/output control of the key panel unit 23 and the hardware control such as setting and maintaining the three-system multiplex-separation control of voice, image and data as well as the man-machine interface control such as message output to the display screen.

The timer circuit 24f is a circuit for outputting data about the current data and time, notifying the microprocessor 24c of parameters indicating the time and indicating the current time and communication time period.

The operation of various parts of the image system will now be described.

The color image signal obtained by the camera 21a is outputted to the video switching circuit 22b. As controlled by the microprocessor 24c, the video switching circuit 22b selects an external image input signal or an image signal of the character superimposing circuit 22a and outputs the selected signal to the image input circuit 22e. The image input circuit 22e distributes the output signal of the video switching circuit 22b to an display processing circuit 22d and the image encoding circuit 22g. The image signal inputted to the image encoding circuit 22g is encoded into a digital image signal compressed to the data transmission speed suitable for the transmission band of the transmission lines according to CCITT recommendation H. 261 and outputs the digital image signal to the signal-multiplex-separation control circuit 24a.

Thus the camera image signal or the external image input signal can be selected and can be sent to the ISDN-user-network interface as the digital image signal.

The digital image signal outputted from the image-signal-system output terminal of the signal-multiplex-separation control circuit 24a is decoded into an analog image signal according to CCITT recommendation H. 261 by the image decoding circuit 22f, and the analog image signal is then outputted to the image output circuit 22c.

Also the display processing circuit 22d converts the image signal (transmitted image signal) outputted from the image input circuit 22e into a mirror image or a point-symmetrical image which is inverted by 180 degrees and outputs the converted image signal to the image output circuit 22c. Under the control of the microprocessor 24c, the display processing circuit 22d selects a miner screen display mode or a normal whole screen display mode.

The image output circuit 22c inputs the image signal, which is outputted from the image decoding circuit 22f, and outputs the image signal to the character superimposing circuit 22a under the control of the microprocessor 24c. The image output circuit 22c also selects a miner screen display or a normal whole screen display.

The image to be outputted on the miner screen section is an output signal of the display processing circuit 22d.

The character superimposing circuit 22a inputs the image signal, which is outputted from the image output circuit 22c, and outputs the image signal to display it on the screen of the display 21b. The character superimposing circuit 22a also superimposes, for example, a registered graphic or a character over the output image signal of the image output circuit 22c to display the resulting signal on the display screen.

It is thereby possible to display the motion picture on the display screen by decoding the received digital image signals to reproduce it as analog image signals. Thus it is possible to monitor or display the graphics or characters on the partial screen.

The operation of various parts of the sound system will now be described.

The voice communication control circuit 24d inputs the voice signal from the signal-multiplex-separation control circuit 24a, decodes the analog voice signal, outputs the decoded voice signal to the analog switch circuit 24i, then encodes the analog voice signal, which is inputted from the analog switch circuit 24i, into the digital voice signal and outputs the digital voice signal to the signal-multiplex-separation control circuit 24a. When it sets a hold status during communication, the hold-function control circuit 24e outputs a hold

sound to the source-side handset or the destination-side handset. The sounder 24h generates a call sound.

In response to depression of the voice switch-over key on the key panel, the analog switch circuit 24i is controlled by the microprocessor 24c. According to the control of the microprocessor 24c, the analog switch circuit 24i selects the voice signal or the external voice input signal to be sent as the signal source to be outputted to the voice communication control circuit 24d.

In response to the depression of the speaker key on the key panel, the hands-free control circuit 24j is controlled the microprocessor 24c. According to the control of the microprocessor 24c, the hands-free control circuit 24j selects the voice input/output path according to the built-in microphone 24k and the speaker 24g instead of the handset 26. If the voice input/output path according to the built-in microphone 24k and the speaker 24g is selected, the hands-free control circuit 24j compares the input signal of the built-in microphone 24k in level with the output signal of the speaker 24g and allows the higher-level signal to pass and cuts off the lower-level signal. It is therefore possible to prevent oscillation, i.e., howling due to the positive feedback loop so that an excellent hands-free communication using the built-in microphone 24k and the speaker 24g can be realized.

The data system will now be described.

The analog-to-digital converter circuit 24l converts the analog signal, which is converted in level by the analog level converter circuit 24m, and also takes the data signal to convert it into a specific-level analog signal. The analog level converter circuit 24m matches the input/output signal level of the analog-to-digital converter circuit 24l with the input/output level of the facsimile connected to the facsimile terminal 28c.

The camera control interface circuit 24n outputs four kinds of digital control signals, i.e. panning, tilting, focusing and zooming signals for controlling the external camera, via the camera-control-signal input/output terminal 28a.

Now the input/output digital signal of the analog-to-digital converter circuit 24l or the input/output digital signal of the camera control interface circuit 24n is selected by the switch that is controlled by the microprocessor 24c, and is then transmitted to the destination telephone from the ISDN-user-network interface terminal 27 after having passed through the signal-multiplex-separation control circuit 24a as the data signal.

During facsimile transmission, in response to the depressing of the FAX key of FIG. 5, the microprocessor 24c controls the switch so that the data signal, which is to be inputted/outputted to the signal-multiplex-separation, is connected with the



analog-to-digital converter circuit 24i. The microprocessor 24c also controls the data transmission rate to set 64 kbps for data and the remaining 64 kbps for voice and image so that facsimile transmission is possible.

By the foregoing operation, the transmission channel of 64 kbps for facsimile is set bidirectionally so that transmission between analog facsimiles is possible.

For facsimile transmission, it should be set by the FAX key both at the destination-side facsimile and at the source-side facsimile, or the signal-multiplex-separation control circuit 24a sends the bit-rate-allocated code to the destination-side telephone, and upon receipt of this code, the destination-side telephone is automatically switched over to the facsimile transmission mode.

Following is the case in which the camera controller and the camera control controller are connected to the camera-control-signal input/output terminal 28a of the video telephone of this embodiment and in which the motion of the external camera connected to the image input terminal 29e of the destination-side telephone is to be remotely controlled.

FIG. 6 shows the system structure in this case.

In FIG. 6, reference numerals 50a and 50b designate two video telephones of FIG. 2; 51a and 51b, ISDN-user-network interface control circuits (corresponding to the circuit 24b of FIG. 1); 52a and 52b, signal-multiplex-separation control circuits (corresponding to the circuits 24a of FIG. 1); 53a and 53b, camera control interface circuits (corresponding to the circuits 24n of FIG. 1); 54, a camera control controller; 55, a camera controller; 56, an external camera; and 57, an ISDN network.

The connection between the video telephone 50a and the camera controller 55 and the connection between the unitary video telephone 50b and the camera control controller 54 are made by respective dedicated cables (four signals).

The camera control digital signals generated by the camera control controller 54 are inputted to the camera control interface circuit 53b as parallel signals. The camera control interface circuit 53b converts the inputted data into serial data which is then inputted to the data port of the signal-multiplex-separation control circuit 52b as data signals. Then the data signals are multiplexed together with voice and image signals, and the multiplexed signals are outputted to the ISDN network 57 via the ISDN-user-network interface control circuit 51b. The multiplexed signal is received by the video telephone 50a, which is the destination side of the video telephone 50b, and is separated into voice, image and data signals in the signal-multiplex-separation control circuit 52a via the ISDN-user-network interface control circuit 51a, and

out of the voice, image and data signals, the data signal is reproduced to four parallel signals via the camera control interface circuit 53a, and these parallel signals are outputted to the camera controller 55.

According to the control signals generated in the camera control controller 54, the camera controller 55 controls vertical movement (tilting), horizontal movement (panning), focusing and zooming of the external camera 56.

It is therefore possible to remotely control the position of the external camera connected with the destination-side telephone from the source-side telephone. The camera position of the destination-side telephone can be controlled with ease by ensuring the display of the source-side telephone.

Following is the case in which an external video tape recorder is connected to the video telephone of this embodiment to realize the caretaker voice/image recording.

In FIG. 7, reference numeral 60 designates a video telephone which comprises the microprocessor 24c, the signal-multiplex-separation control circuit 24a, the image CODEC 22, the voice communication control circuit 24d and the ISDN-user-network interface control circuit 24b. Further, 66 designates an external video tape recorder, and 67, an ISDN network.

FIG. 8 shows the procedures to realize the caretaker voice/image recording operation with this structure.

As shown in FIG. 7, first the source-side video telephone is set to the caretaker mode by the key panel. The setting of the caretaker mode displays a predetermined menu on the display 21b according to the menu key shown in FIG. 5, so that the input as set will be received. During the caretaker mode, the microprocessor 24c controls various parts so as to perform automatic receiving communication.

If any communication is received from the destination-side telephone, the ISDN-user-network control circuit 24b automatically performs the communication receiving operation, notifies the microprocessor 24c of this receipt and detects the telephone number of the destination-side telephone from the received information so as to be able to store the number in the built-in memory.

The telephone at this end of the line transmits the absence message to the telephone at the other end to notify that the person at this end is absent. The absence message may be predetermined image information stored in the video tape recorder 66 or may be predetermined image information that is stored in other data storage means.

Then the microprocessor 24c instructs the external video tape recorder 66 to start recording. The video tape recorder 66 is previously connected to the external voice output terminal 29b and the

image output terminal 29e of the telephone at this end via respective cables. Between the microprocessor 24c and the video tape recorder 66, a remote-control signal line of the video tape recorder 66 is connected.

After having received any message from the telephone at the other end, the unitary video telephone 60 that has received from the network a notice of disconnect due to the disconnect of a call from the telephone at the other end controls the video tape recorder 66 to stop recording and then returns to the standby state.

Thus it is possible to record the message in voice and image while there is nobody at the receiving-side telephone.

If the power supply from an external source is cut off, the video telephone of this embodiment may operate the voice communicating function using a local power supply taken from the ISDN network, as described below.

FIG. 9 shows this kind of video telephone for realizing the foregoing operation.

As shown in FIG. 9, the video telephone 90 comprises an ISDN-user-network interface control circuit 24b, a signal-multiplex-separation control circuit 24a, a microprocessor 24c, a voice communication control circuit 24d, a handset 26, an image CODEC 22, the camera 21a and a display 21b.

In FIG. 9, reference numeral 91a designates a DC-to-DC converter for converting a d.c. voltage from the local source into a constant voltage; 91b, a power source; 91c, a voltage detector circuit for detecting whether or not a commercial power supply is present; 91d, a control circuit for realizing the voice communication function while the commercial power supply is cut off; 97a and 97b, switches for causing a multiplex-separation control unit 93 to be bypassed so that the amount of electric power to be consumed in the circuit at the time of local power supply can be reduced; and 99, an ISDN network.

With this arrangement, when the input of the external commercial power to the power source unit 25 is stopped, the voltage detector circuit 91c detects the absence of the external power supply and gives such notice to the control circuit 91d. The control circuit 91d causes the signal-multiplex-separation control circuit 24a to be bypassed in order to save on the amount of electric power to be consumed and controls the switches 97a, 97b in such a manner that the voice signal is connected to the voice communication control circuit 24d directly by the ISDN-user-network interface control circuit 24b. The DC-to-DC converter 91a reduces a d.c. voltage from a local power source into a constant d.c. voltage and supplies the voltage only to the circuit that realizes the voice communication function.

If the voltage detector circuit 91c detects the absence of any external voltage, the control circuit 91d sets the ISDN-user-network interface control circuit 24d in such a manner that a telephone controller 95 is controlled by the ISDN-user-network interface control circuit 24b.

It is thus possible to realize the voice communication function even when the power supply is cut off.

In the video telephone of this embodiment, the power supply unit 25 may be equipped with a charger and a charge control circuit for normally charging the charger with the local supply power until the charged electric power exceeds a value capable of driving the entire system for a constant time and for supplying to various parts the electric power charged in the charger when the power supply is cut off, so that not only the voice communication function but also the entire system can be operated in the same manner as when the power supply is not cut off.

Further, the video telephone may be equipped with a memory for storing telephone numbers, the names of the owners of the telephones and other information as well as image information about the owner such as an identification picture, so that when receiving a message, if the calling telephone number can be found in the memory, the name and information of the owner as well as image information will be indicated on the display.

If there are provided the automatic transmission mode for transmitting the image to the telephone at other end upon connection therewith and the manual transmission mode for transmitting the image to the telephone at the other end after receiving a predetermined key input after being connected with the other end, the video telephone may be equipped with a memory for storing a plurality of telephone numbers, so that if the telephone number of the other end is not stored in the memory even in the automatic transmission mode, the control may be forcibly switched over to the manual transmission mode.

As mentioned above, according to the video telephone of this invention, since it is equipped with a lamp, it is possible to shoot a picture, a piece of writing or an other document well. The video telephone can also be connected with an analog facsimile machine, and enables communication without holding the handset, thanks to the hands-free function.

## Claims

1. A video telephone for exchanging image data, voice data and user data through digital communication lines in real time, comprising:
  - (a) a communication controller for control-



ling communication of an image data, a voice data and a user data, which are multiplexed, through the digital communication lines;

(b) a multiplex separator for separating a multiplexed image data, a voice data and a user data which are to be transmitted and received by said communication controller;

(c) an image CODEC for decoding an image data, which are separated by said multiplex separator, into an image signal and for coding an input image signal into image data and transmitting an image data to said multiplex separator;

(d) a camera for outputting an image signal, which is taken by said camera, to said image CODEC as an image signal to be coded;

(e) a display for displaying an image represented by an image signal which is decoded by said image CODEC;

(f) a voice communication controller for decoding a voice data, which are separated by said multiplex separator, into a voice signal and for coding an input voice signal into voice data and transmitting a voice data to said multiplex separator;

(g) a handset having a speaker for outputting a voice represented by an voice signal which is decoded by said voice communication controller, and a microphone for transmitting the voice signal, which is produced by said microphone, to said voice communication controller as the voice signal to be coded;

(h) a power supply unit for receiving a supply of power from an external source and distributing the power to various parts;

(i) a key input unit having a plurality of keys; and

(j) a control unit for controlling, in response to a key input from said key input unit, allocation of the data rate at which the image data, the voice data and the user data are separated by said multiplex separator.

2. A video telephone according to claim 1, further comprising: an image input terminal; a video switch for outputting the image signal from said camera or the input image signal from said image input terminal to said image CODEC as the image signal to be coded; an image output terminal for outputting the image signal decoded by said image CODEC; a voice input terminal; another microphone; an audio switch for outputting an input signal from said voice input terminal or the voice signal taken by the first-named microphone or the voice

signal taken by the second-named microphone to said voice communication controller as the voice signal to be coded; a voice output terminal; another speaker; another audio switch for outputting the voice signal, which is decoded by said voice communication controller, to the first-named speaker or the second-named speaker or said voice output terminal; a serial data interface; a facsimile terminal; a camera control terminal; and a selector disposed in said multiplex separator for switching over inputting and outputting of the user data between said multiplex separator and each of said serial data interface, said facsimile terminal and said camera control terminal;

wherein said control unit is operable, in response to the key input from said key input unit, for controlling said video switch, said first-named audio switch, said second-named audio switch and said selector.

3. A video telephone for exchanging image data, voice data and user data through digital communication lines in real time, comprising:

(a) a communication controller for controlling communication of the image data, the voice data and the user data, which are multiplexed, through the digital communication lines;

(b) a multiplex separator for separating the multiplexed image data, the voice data and the user data which are to be transmitted and received by said communication controller;

(c) an image CODEC for decoding the image data, which are separated by said multiplex separator, into an image signal and for coding an input image signal into image data and transmitting the image data to said multiplex separator;

(d) a camera for producing and outputting the image signal, to said image CODEC as the image signal to be coded;

(e) a display for displaying an image represented by the image signal which is decoded by said image CODEC;

(f) a voice communication controller for decoding the voice data, which are separated by said multiplex separator, into a voice signal and for coding an input voice signal into voice data and transmitting the voice data to said multiplex separator;

(g) a handset for outputting a voice according to the voice signal decoded by said voice communication controller and for transmitting the thus produced voice signal to said voice communication controller as the voice signal to be coded;

- (h) a speaker for outputting a voice according to the voice signal decoded by said voice communication controller;
- (i) a microphone for producing and transmitting a voice signal to said voice communication controller as the voice signal to be coded;
- (j) a first audio switch for outputting the voice signal produced said handset or the voice signal produced in by said microphone, to said voice communication controller as the voice signal to be coded;
- (k) a second audio switch for outputting the voice signal from said voice communication controller to said handset or said speaker;
- (l) a power supply unit for receiving a supply of power from an external source and for distributing the power to various parts;
- (m) a key input unit having a plurality of keys; and
- (n) a control unit for controlling, in response to a key input from said key input unit, allocation of data rate at which the image data, the voice data and the user data are separated by said multiplex separator.
4. A video telephone according to claim 1, further comprising: a digital-to-analog converter for converting the user data, which is separated by said multiplex separator, into an analog signal; a facsimile input/output terminal for outputting the analog signal, which is converted by said digital-to-analog converter, to a facsimile and for inputting an analog signal from said facsimile; and an analog-to-digital converter for converting the analog signal, which is inputted from said facsimile input/output terminal, into digital data and for outputting the digital data to said multiplex separator as user data.
5. A video telephone system comprising:
- (I) a video telephone for exchanging image data, voice data and user data through digital communication lines in real time, said video telephone including (a) a communication controller for controlling communication of the image data, the voice data and the user data, which are multiplexed, through the digital communication lines, (b) a multiplex separator for multiplex-separating the image data, the voice data and the user data which are to be transmitted and received by said communication controller, (c) an image CODEC for decoding the image data, which are separated by said multiplex separator, into an image signal and for coding an input image signal into image data

and transmitting the image data to said multiplex separator, (d) a camera for producing and outputting the image signal to said image CODEC as the image signal to be coded, (e) a display for displaying an image represented by the image signal which is decoded by said image CODEC, (f) a voice communication controller for decoding the voice data, which are separated by said multiplex separator, into a voice signal and for coding an input voice signal into voice data and transmitting the voice data to said multiplex separator as the voice signal to be coded, (g) a handset for transmitting and outputting a voice according to the voice signal decoded by said voice communication controller and for transmitting the thus produced voice signal to said voice communication controller as the voice signal to be coded, (h) a speaker for outputting a voice according to the voice signal decoded by said voice communication controller, (i) a microphone for producing and transmitting a voice signal to said voice communication controller as the voice signal to be coded, (j) a first audio switch for outputting to said voice communication controller the voice signal produced in said handset or the voice signal produced by said microphone, (k) a second audio switch for outputting the voice signal from said voice communication controller to said handset or said speaker, (l) a power supply unit for receiving a supply of power from an external source and for distributing the power to various parts, (m) a key input unit having a plurality of keys, and (n) a control unit for controlling, in response to a key input from said key input unit, allocation of data rate at which the image data, the voice data and the user data are separated by said multiplex separator;

(II) an external camera connected to an image input terminal of said video telephone; and

(III) a camera controller connected to a camera control terminal of said video telephone for controlling panning, tilting, zooming and focusing operations of said external camera.

6. A video telephone for exchanging image data, voice data and user data through digital communication lines in real time, comprising:
- (I) a mainframe-and-display unit including (a) a communication controller for controlling communication of the image data, the voice data and the user data, which are multiplexed, through the digital communica-

tion lines, (b) a multiplex separator for multiplex-separating the image data, the voice data and the user data which are to be transmitted and received by said communication controller, (c) an image CODEC for decoding the image data, which are separated by said multiplex separator, into an image signal and for coding an input image signal into image data and transmitting the image data to said multiplex separator, (d) a voice communication controller for decoding the voice data, which are separated by said multiplex separator, into a voice signal and for coding an input voice signal into voice data and transmitting the voice data to said multiplex separator, (e) a speaker for outputting a voice according to the voice signal decoded by said voice communication controller, (f) a microphone for producing and transmitting the voice signal to said voice communication controller as the voice signal to be coded, (g) a first audio switch for outputting to said voice communication controller the voice signal produced in said handset or the voice signal produced by said microphone, (h) a second audio switch for outputting the voice signal from said voice communication controller to said handset or said speaker, (i) a power supply unit for receiving a supply of power from an external source and for distributing the power to various parts, (j) a key input unit having a plurality of keys, (k) a control unit for controlling, in response to a key input from said key input unit, allocation of the data rate at which the image data, the voice data and the user data are separated by said multiplex separator, and (l) a display for displaying an image represented by the image signal which is decoded by said image CODEC; and

(ll) a camera unit including (m) a camera for producing and outputting an image signal to said image CODEC as the image signal to be coded and (n) a lamp for illuminating a subject to be taken by said camera, said camera unit being angularly movably connected to said mainframe-and-display unit.

7. A video telephone for exchanging image data, voice data and user data through digital communication lines in real time, comprising:

(l) a mainframe-and-display unit including (a) a communication controller for controlling communication of the image data, the voice data and the user data, which are multiplexed, through the digital communication lines, (b) a multiplex separator for

multiplex-separating the image data, the voice data and the user data which are to be transmitted and received by said communication controller, (c) an image CODEC for decoding the image data, which are separated by said multiplex separator, into an image signal and for coding an input image signal into image data and transmitting the image data to said multiplex separator, (d) a voice communication controller for decoding the voice data, which are separated by said multiplex separator, into a voice signal and for coding an input voice signal into voice data and transmitting the voice data to said multiplex separator, (e) a speaker for outputting a voice according to the voice signal decoded by said voice communication controller, (f) a microphone for producing and transmitting a voice signal to said voice communication controller as the voice signal to be coded, (g) a first audio switch for outputting to said voice communication controller the voice signal produced in said handset or the voice signal produced by said microphone, (h) a second audio switch for outputting the voice signal from said voice communication controller to said handset or said speaker, (i) a power supply unit for receiving a supply of power from an external source and for distributing the power to various parts, (j) a key input unit having a plurality of keys, (k) a control unit for controlling, in response to a key input from said key input unit, allocation of data rate of the image data, the voice data and the user data while being separated by said multiplex separator, and (l) a display for displaying an image represented by the image signal which is decoded by said image CODEC; and

(ll) a camera unit accommodating a camera, which is connected to said image CODEC by a cable, for outputting the image signal, which is taken by said camera, to said image CODEC as the image signal to be coded, said camera unit being detachably connected with said mainframe-and-display unit.

8. A video telephone for exchanging image data, voice data and user data through digital communication lines in real time, comprising:

(l) a mainframe-and-display unit including (a) a communication controller for controlling communication of the image data, the voice data and the user data, which are multiplexed, through the digital communication lines, (b) a multiplex separator for

multiplex-separating the image data, the voice data and the user data which are to be transmitted and received by said communication controller, (c) an image CODEC for decoding the image data, which are separated by said multiplex separator, into an image signal and for coding an input image signal into image data and transmitting the image data to said multiplex separator, (d) a voice communication controller for decoding the voice data, which are separated by said multiplex separator, into a voice signal and for coding an input voice signal into voice data and transmitting the voice data to said multiplex separator, (e) a speaker for outputting a voice according to the voice signal decoded by said voice communication controller, (f) a microphone for producing and transmitting a voice signal to said voice communication controller as the voice signal to be coded, (g) a first audio switch for outputting to said voice communication controller the voice signal produced in said handset or the voice signal produced by said microphone, (h) a second audio switch for outputting the voice signal from said voice communication controller to said handset or said speaker, (i) a power supply unit for receiving a supply of power from an external source and for distributing the power to various parts, (j) a key input unit having a plurality of keys, (k) a control unit for controlling, in response to a key input from said key input unit, allocation of the data rate at which the image data, the voice data and the user data are separated by said multiplex separator, and (l) a display for displaying an image represented by the image signal which is decoded by said image CODEC; and

(II) a camera unit accommodating a camera, which is connected to said image CODEC by a cable, for outputting the image signal, which is taken by said camera, to said image CODEC as the image signal to be coded, said camera being slidably mounted in said camera unit, said camera unit being slidably attached to said mainframe-and-display unit.

9. A video telephone system comprising a video telephone for exchanging image data, voice data and user data through digital communication lines in real time, and a video tape recorder,

wherein said video telephone includes (a) a communication controller for controlling communication of the image data, the voice data

and the user data, which are multiplexed, through the digital communication lines, (b) a multiplex separator for multiplex-separating the image data, the voice data and the user data which are to be transmitted and received by said communication controller, (c) an image CODEC for decoding the image data, which are separated by said multiplex separator, into an image signal and for coding an input image signal into image data and transmitting the image data to said multiplex separator, (d) a camera for producing and outputting an image signal to said image CODEC as the image signal to be coded, (e) a display for displaying an image represented by the image signal which is decoded by said image CODEC, (f) a voice communication controller for decoding the voice data, which are separated by said multiplex separator, into a voice signal and for coding an input voice signal into voice data and transmitting the voice data to said multiplex separator as the voice signal to be coded, (g) a handset for outputting a voice according to the voice signal decoded by said voice communication controller and for transmitting the thus produced voice signal to said voice communication controller as the voice signal to be coded, (h) a speaker for outputting a voice according to the voice signal decoded by said voice communication controller, (i) a microphone for producing and transmitting a voice signal to said voice communication controller as the voice signal to be coded, (j) a first audio switch for outputting to said voice communication controller the voice signal taken said handset or the voice signal taken by said microphone, (k) a second audio switch for outputting the voice signal from said voice communication controller to said handset or said speaker, (l) a power supply unit for receiving a supply of power from an external source and for distributing the power to various parts, (m) a key input unit having a plurality of keys, (n) a control unit for controlling, in response to a key input from said key input unit, allocation of the data rate at which the image data, the voice data and the user data are separated by said multiplex separator, (o) a memory for storing the image data, and (p) a VTR control signal terminal for outputting a VTR control signal instructing an action of said video tape recorder by said control unit;

wherein said video tape recorder is connected to said image output terminal, said voice output terminal and said VTR control signal terminal; and

wherein for incoming data after caretaker image recording is designated by a key of said

key input unit, said control unit of said video telephone reads the image data from said memory to send the same image data to said multiplex separator, outputs the input image signal and the voice signal respectively to said image output terminal and said voice output terminal, and outputs to said VTR control signal terminal a VTR control signal instructing picture and voice recording actions.

10. A video telephone which is adapted to be connected to a digital communication network for a local power supply and which exchanges image data, voice data and user data in real time through digital communication lines provided by the digital communication network, said video telephone comprising:

(a) a communication controller for controlling communication of the image data, the voice data and the user data, which are multiplexed, through the digital communication lines;

(b) a multiplex separator for multiplex-separating the image data, the voice data and the user data which are to be transmitted and received by said communication controller;

(c) an image CODEC for decoding the image data, which are separated by said multiplex separator, into an image signal and for coding an input image signal into image data and transmitting the image data to said multiplex separator;

(d) a camera for producing and outputting an image signal to said image CODEC as the image signal to be coded;

(e) a display for displaying an image represented by the image signal which is decoded by said image CODEC;

(f) a voice communication controller for decoding the voice data, which are separated by said multiplex separator, into a voice signal and for coding an input voice signal into voice data and transmitting the voice data to said multiplex separator;

(g) a handset having a speaker for outputting a voice represented by the voice signal which is decoded by said voice communication controller, and a microphone for producing and transmitting a voice signal to said voice communication controller as the voice signal to be coded;

(h) a power supply unit for receiving a supply of power from an external source and distributing the power to various parts, said power supply unit including a voltage converter for converting a voltage of the local power supply into an internal voltage to be

used in the video telephone, a detector for detecting an interruption of the supply of power from said external source, and a power distributor for distributing, if said detector detects interruption of the supply of power, to the various parts except at least said camera, said display and said image CODEC the power whose voltage is converted by said power converter;

(i) a key input unit having a plurality of keys; and

(j) a control unit for controlling, in response to a key input from said key input unit, allocation of the data rate at which the image data, the voice data and the user data are separated by said multiplex separator.

11. A video telephone which is adapted to be connected to a digital communication network for a local power supply and which exchanges image data, voice data and user data in real time through digital communication lines provided by the digital communication network, said video telephone comprising:

(a) a communication controller for controlling communication of the image data, the voice data and the user data, which are multiplexed, through the digital communication lines;

(b) a multiplex separator for multiplex-separating the image data, the voice data and the user data which are to be transmitted and received by said communication controller;

(c) an image CODEC for decoding the image data, which are separated by said multiplex separator, into an image signal and for coding an input image signal into image data and transmitting the image data to said multiplex separator;

(d) a camera for producing and outputting an image signal to said image CODEC as the image signal to be coded;

(e) a display for displaying an image represented by the image signal which is decoded by said image CODEC;

(f) a voice communication controller for decoding the voice data, which are separated by said multiplex separator, into a voice signal and for coding an input voice signal into voice data and transmitting the voice data to said multiplex separator;

(g) a handset having a speaker for outputting a voice represented by the voice signal which is decoded by said voice communication controller, and a microphone for producing and transmitting a voice signal to said voice communication controller as the

voice signal to be coded;

(h) a power supply unit for receiving a supply of power from an external source and distributing the power to various parts, said power supply unit including a charger for charging the power supplied from the local power supply, a detector for detecting the interruption of the supply of power from said external source, and a power distributor for distributing, if said detector detects the interruption of the supply of power, to the various parts the power charged by said charger;

(i) a key input unit having a plurality of keys; and

(j) a control unit for controlling, in response to a key input from said key input unit, allocation of the data rate at which the image data, the voice data and the user data are separated by said multiplex separator.

12. A video telephone according to claim 6, wherein said camera unit has means for illuminating said lamp while said camera unit is angularly movably over a predetermined angle with respect to said mainframe-and-display unit.



FIG. 1

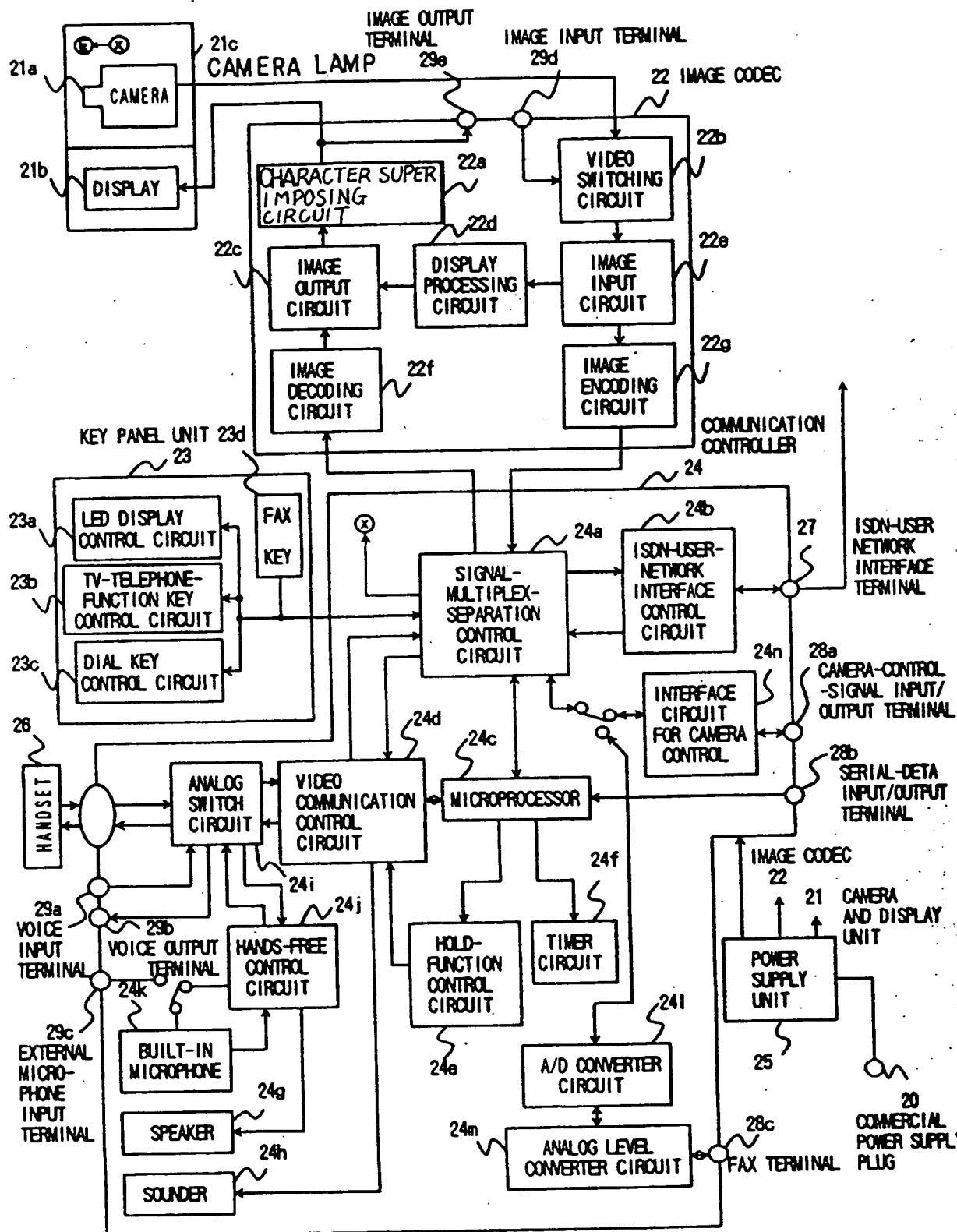


FIG.2

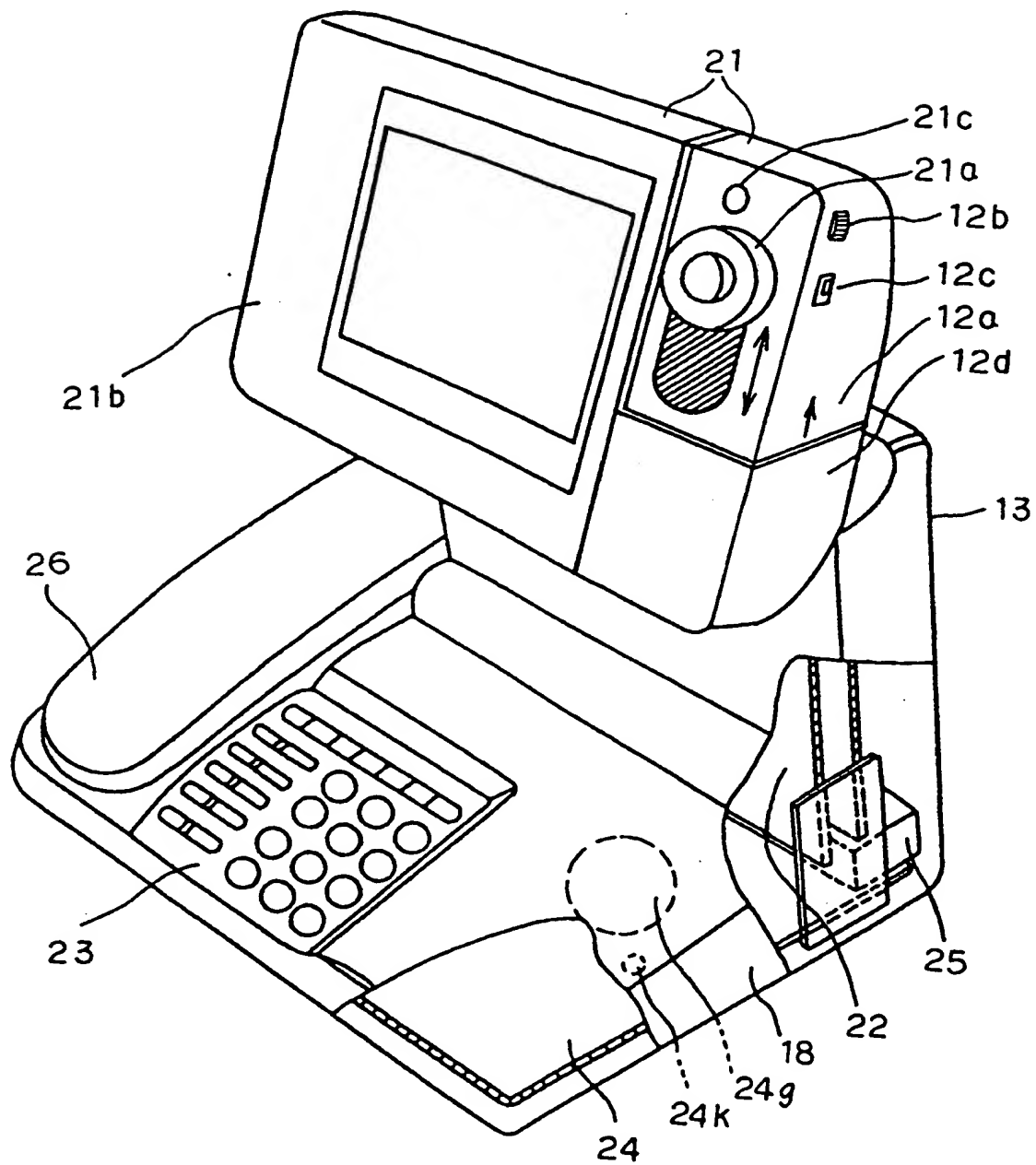


FIG. 3

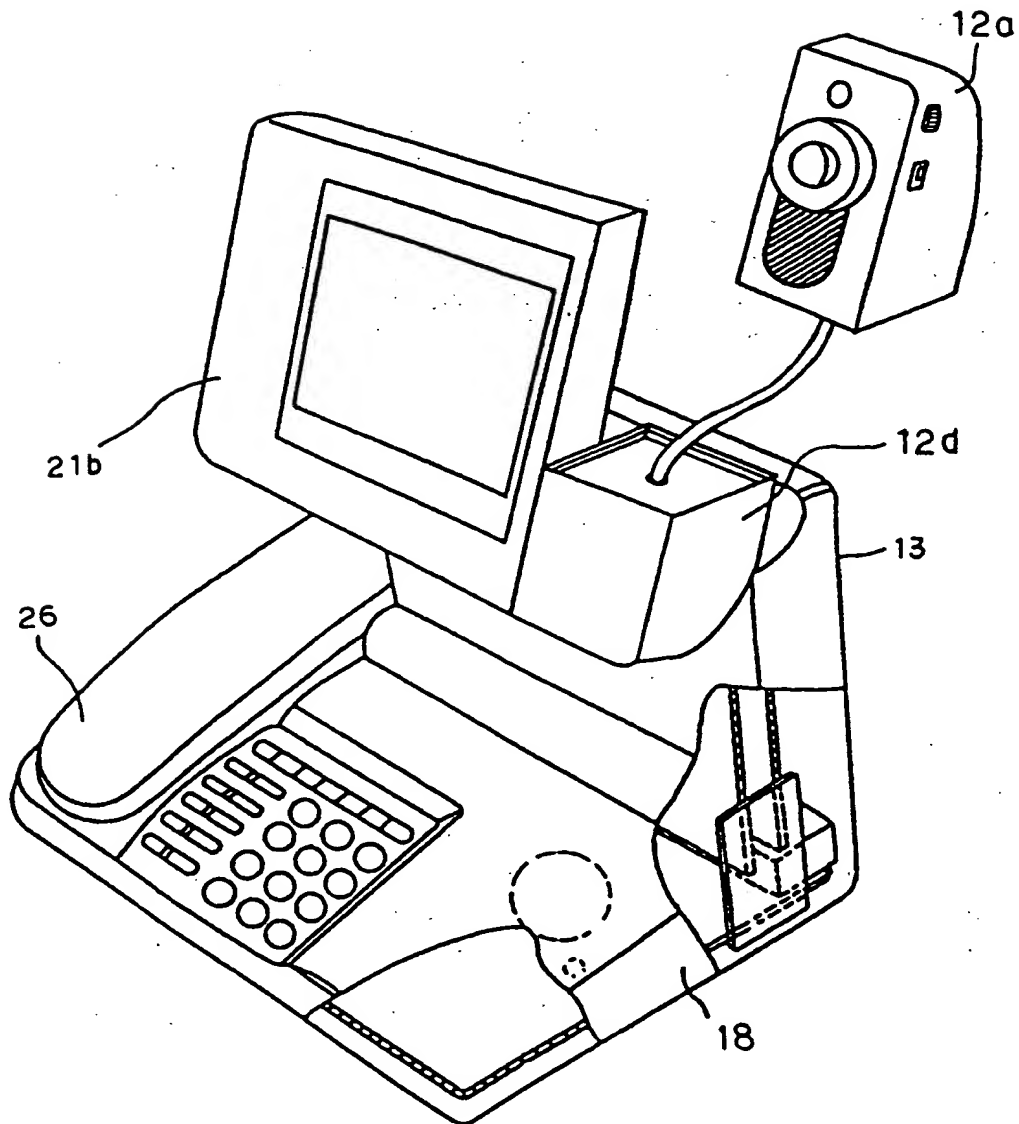


FIG. 4

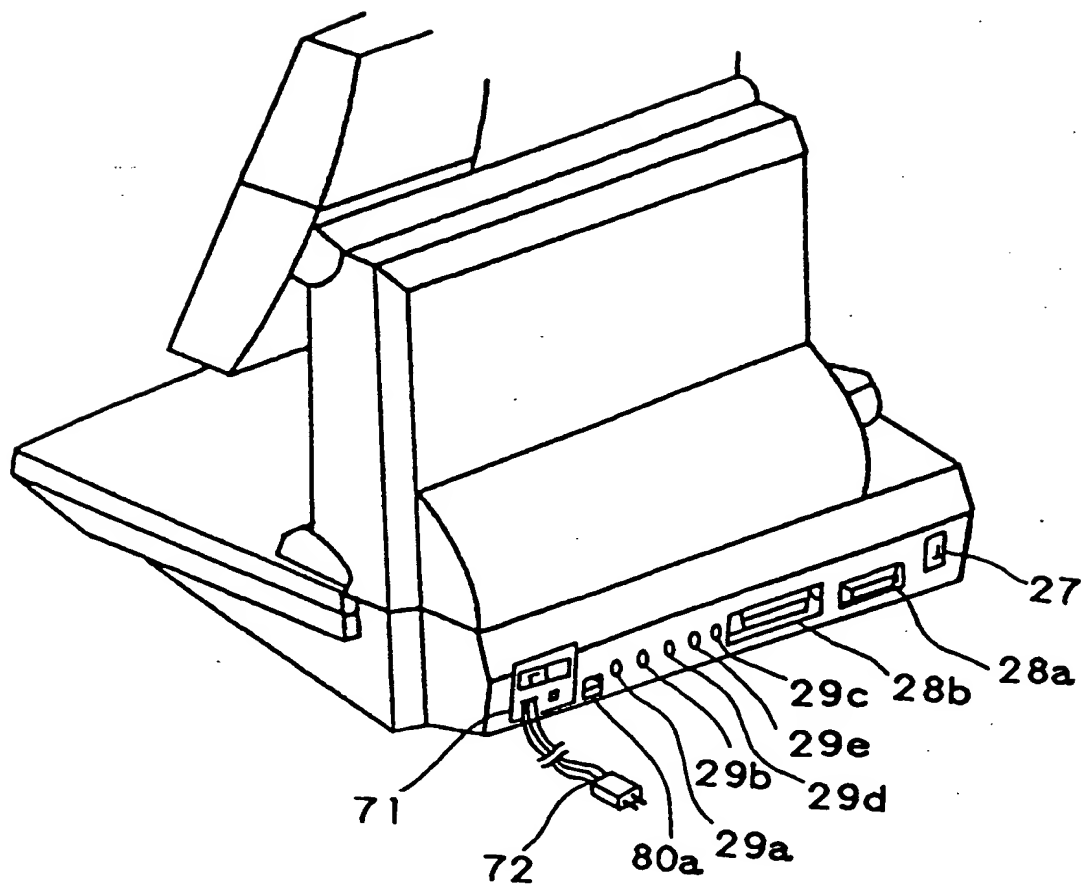


FIG. 5

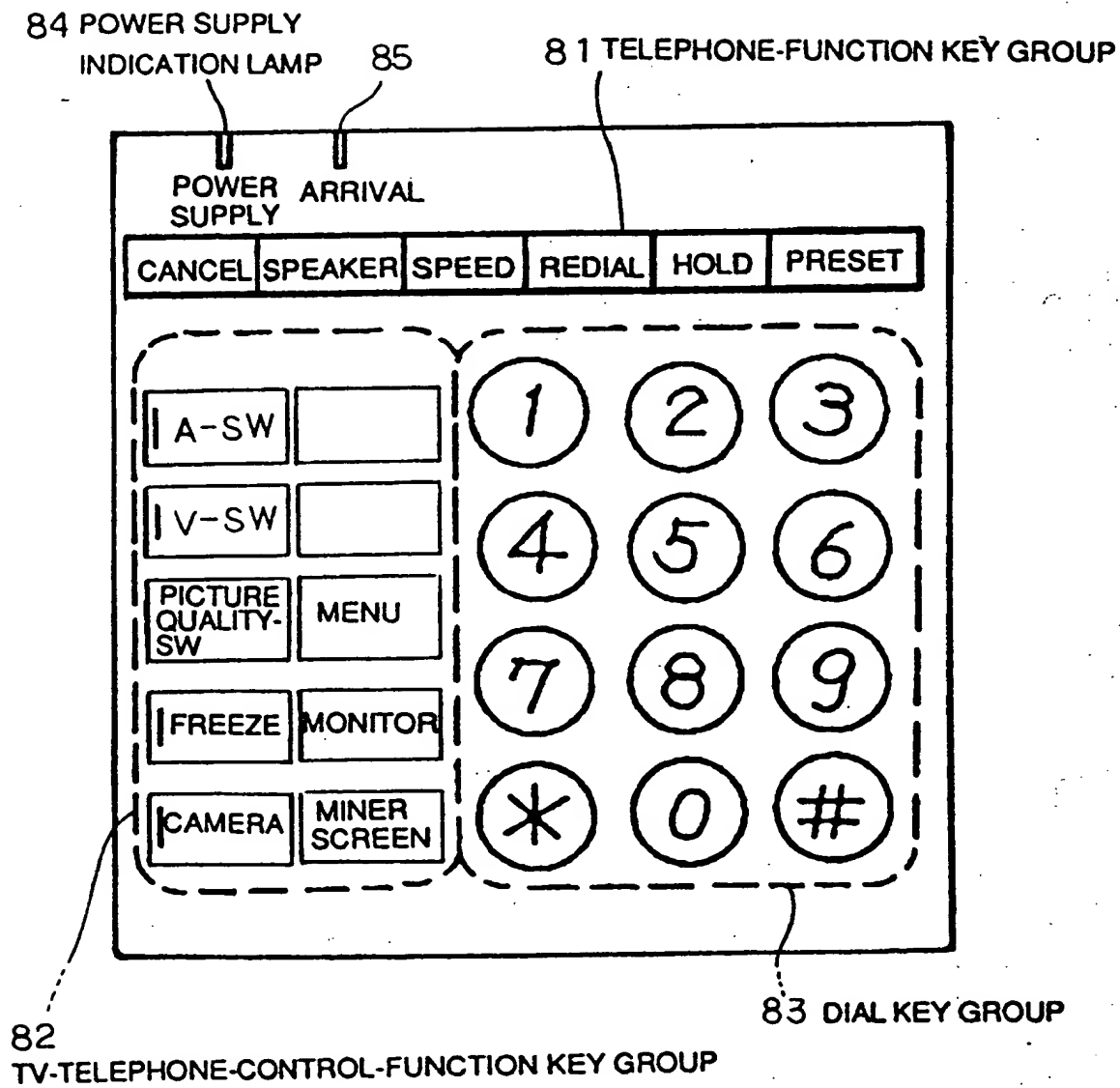


FIG. 6

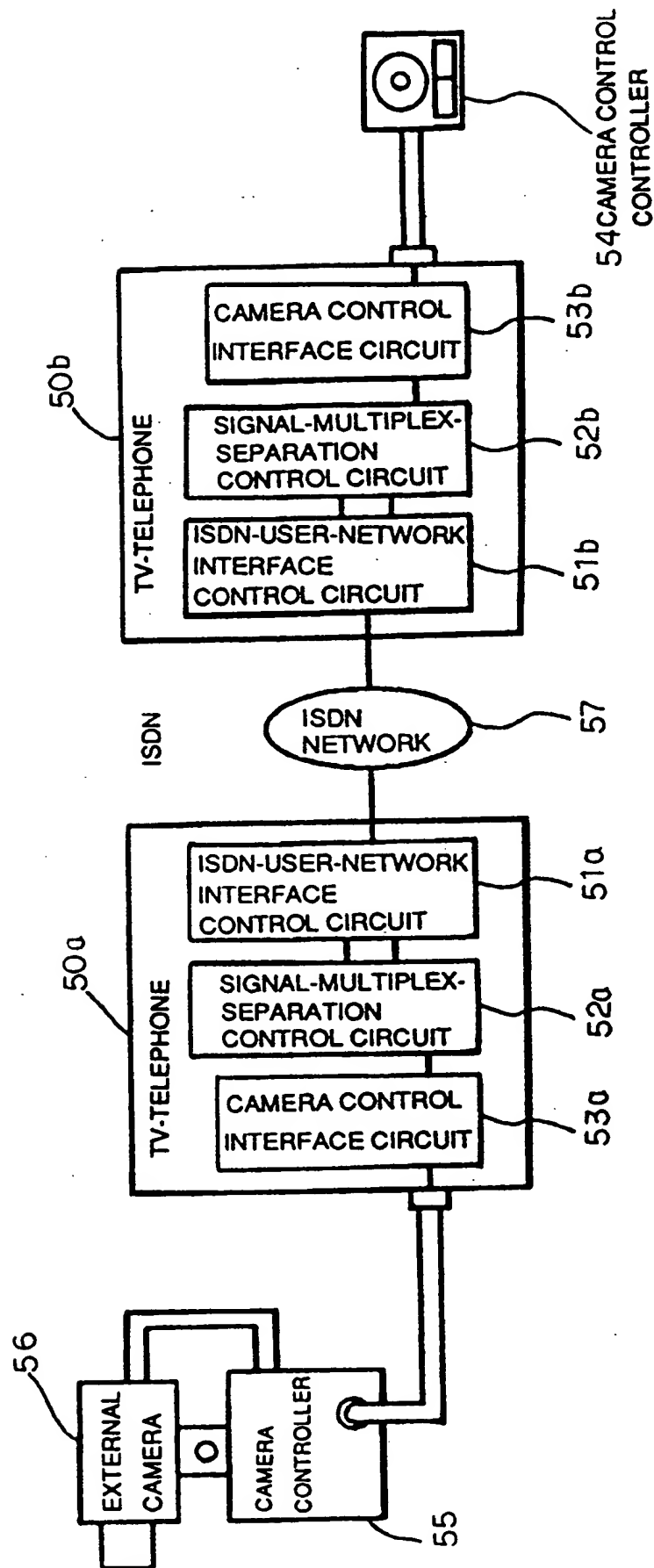




FIG. 7

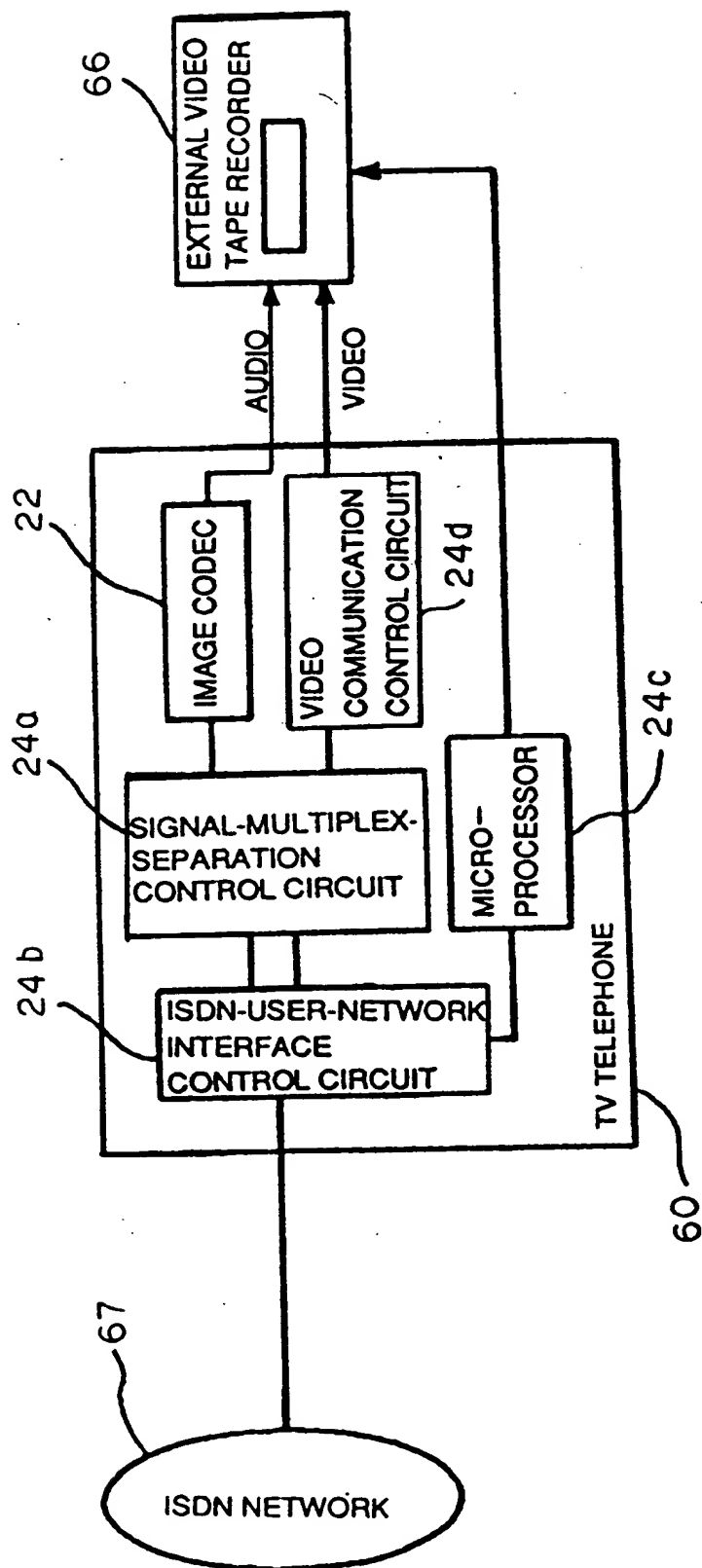


FIG. 8

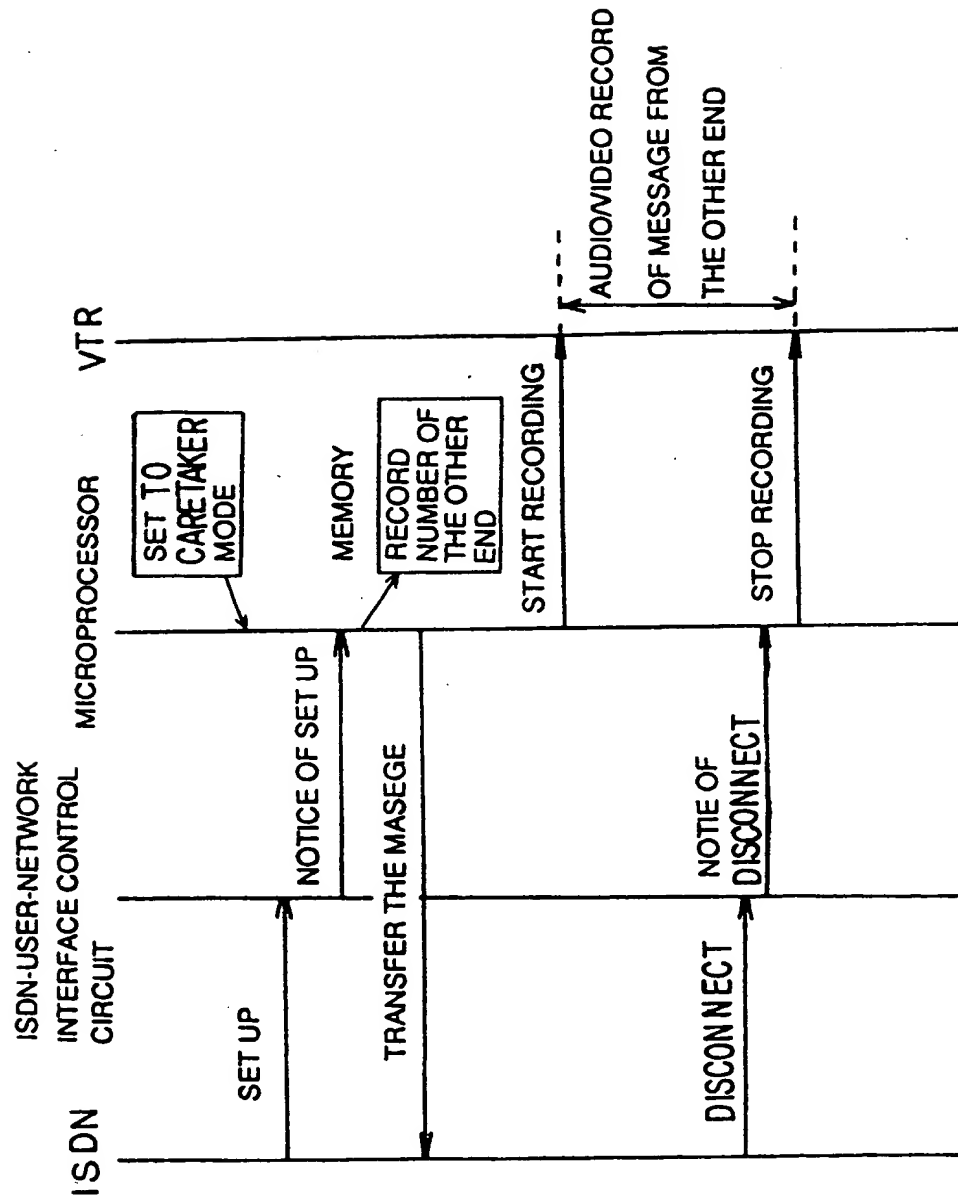
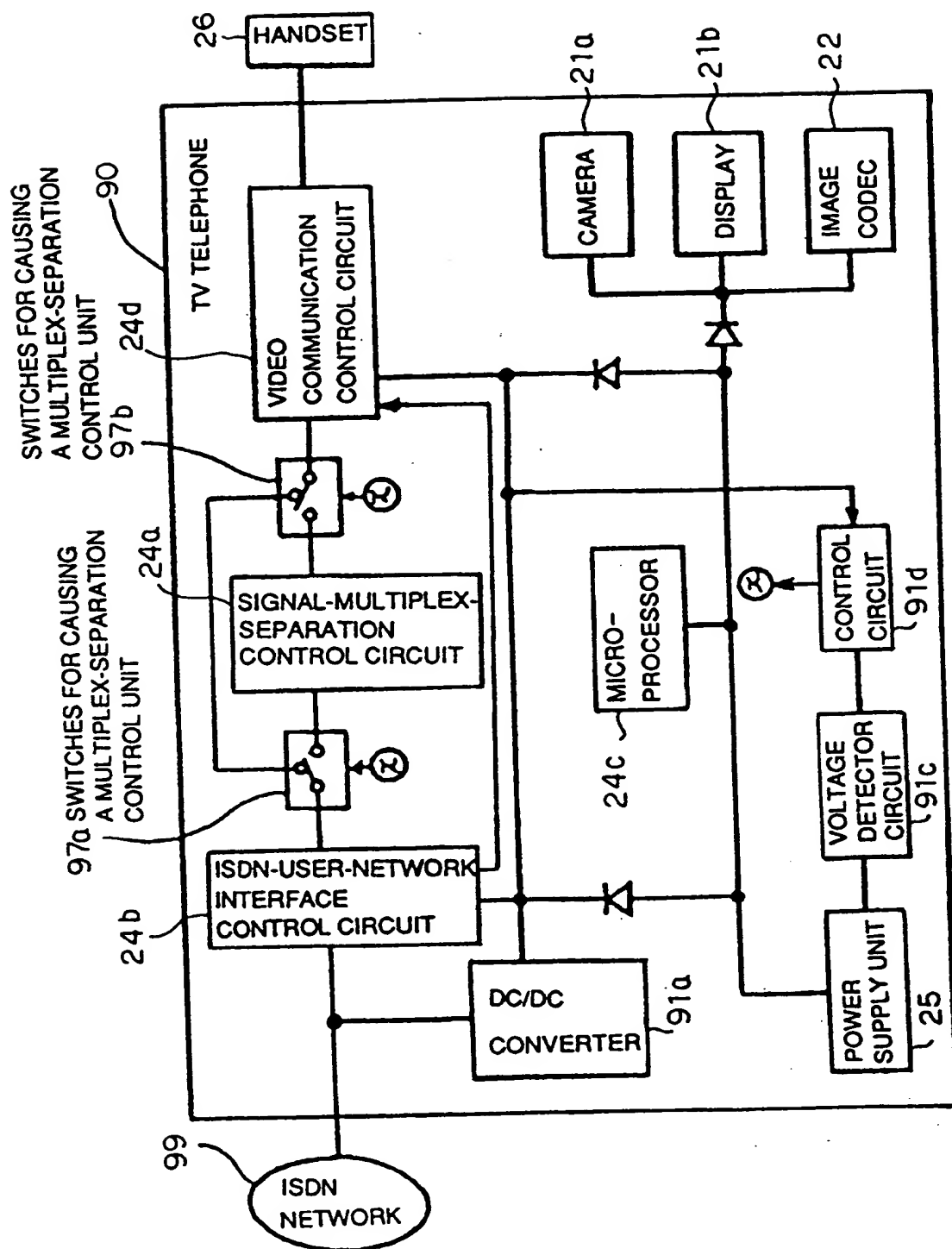


FIG. 9



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